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Title of the invention:
METHOD OF TRANSMITTING MUSICAL PERFORMANCE INFORMATION, TRANSMITTING APPARATUS, AND RECEIVING APPARATUS

What is claimed is:

1. A musical performance information transmitting method for transmitting by utilizing data channels digital data information for musical instrument performance, characterized in that the transmission is performed by packets, with time information to be reproduced at a receiving end attached, when the amount of information, representing events that represent the tone pitch of a performing musical instrument and the tone intensity corresponding to the tone pitch and representing the elapsed time between events, reaches a predetermined value or when the total of the elapsed time between the events reaches another specified value.

2. A musical performance information transmitting apparatus for transmitting by utilizing data channels digital data information for musical instrument performance, characterized in that the transmitting apparatus is provided with a means for multiplexing image signals, voice signals, and digital data signals; and a means for multiplexing digital data information by the packet to the digital data signals; the digital data information includes events that represent the tone pitch for musical instrument performance and the tone intensity corresponding to the tone pitch and representing the elapsed time between the events, and provided with a means capable of packet transmission with time information to be reproduced on the receiving end attached when the amount of information reaches a predetermined value or when the total of the elapsed time between the events reaches another specified value.

3. A musical performance information receiving apparatus for receiving digital data information for musical instrument performance coming as transmitted by utilizing data channels, characterized in that the receiving apparatus is provided with;

a means for demultiplexing from the signals coming as transmitted the image signals, voice signals, and the digital data information coming as multiplexed by the packet and transmitted with the digital data signals coming as multiplexed,

a means for extracting information representing events that represent the tone pitch for musical instrument performance and the tone intensity corresponding to the tone pitch contained in the demultiplexed digital data information, and representing the elapsed time between the events and

a means capable of reproducing musical performance by controlling the extracted information with the time information separately contained in the digital data information and to be reproduced on the receiving end.

Detailed Description of the Invention

Field of the Invention

This invention relates to utilizing for example satellite broadcast data channels, in particular to a method of transmitting data information for musical performance together with time information to be reproduced in the receiving end and that highly precisely synchronously with images and voices of a main program, and also relates to a transmitting apparatus and a receiving apparatus required for the transmitting method.

Prior Art

A method known heretofore for transmitting musical performance information utilizes a dedicated wired transmitting route through which MIDI (musical instrument digital interface) signals are transmitted.

Problems to be Solved by the Invention

When the known, dedicated, wired transmitting route is used to transmit musical performance information, the transmission efficiency is poor. There is another method of digitally transmitting data of musical performance information by utilizing data channels of a broadcast satellite or the like. However, good transmitting efficiency cannot be expected if the data are transmitted as they are.

To utilize the data channels efficiently, it is conceivable to insert the digital data by the packet into data channels. With the packet type of transmission, however, transmission of data in real time is difficult.

Therefore, the object of this invention is to provide a musical performance information transmitting method, a transmitting apparatus and a receiving apparatus required for the transmitting method that overcome the above-described difficulty, make it possible to insert the digital data of the musical performance information into the packet type of data channels as that of the broadcast satellite with which, although transmission efficiency is good, transmission in real time is impossible.

Details of the satellite broadcast data channels and the packet method described in the above paragraph, and the transmission of time information to be described later are described in the specification of the patent application (1) "TIME INFORMATION TRANSMITTING METHOD, TRANSMITTING APPARATUS, AND RECEIVING APPARATUS" submitted by the same applicant on the same day.

Means for Solving the Problems

To accomplish the above object, the invention of claim 1 relates to a musical performance information transmitting method for transmitting by utilizing data channels digital data information for musical instrument performance, characterized in that the transmission is performed by packets, with time information to be reproduced at a receiving end attached, when the amount of information, representing events that represent the tone pitch of a performing musical instrument and the tone intensity corresponding to the tone pitch and representing the elapsed time between events, reaches a predetermined value or when the total of the elapsed time between the events reaches another specified value.

The invention of claim 2 relates to a musical performance information transmitting apparatus for transmitting by utilizing data channels digital data information for musical instrument performance, characterized in that the transmitting apparatus is provided with a means for multiplexing image signals, voice signals, and digital data signals; and a means for multiplexing digital data information by the packet to the digital data signals; the digital data information includes events that represent the tone pitch for musical instrument performance and the tone intensity corresponding to the tone pitch and representing the elapsed time between the events, and provided with a means capable of packet transmission with time information to be reproduced on the receiving end attached when the amount of information reaches a predetermined value or when the total of the elapsed time between the events reaches another specified value.

The invention of claim 3 relates to a musical performance information receiving apparatus for receiving digital data information for musical instrument performance coming as transmitted by utilizing data channels, characterized in that the receiving apparatus is provided with;

a means for demultiplexing the image signals, voice signals, and the digital data information coming as multiplexed by the packet and transmitted with the digital data signals coming as multiplexed,

a means for extracting information representing events that represent the tone pitch for musical instrument performance and the tone intensity corresponding to the tone pitch contained in the demultiplexed digital data information and representing the elapsed time between the events and

a means capable of reproducing musical performance by controlling the extracted information with the time information to be reproduced on the receiving end and separately contained in the digital data information.

Embodiment

An embodiment of this invention will be described below in detail in reference to the

appended figures.

FIG. 1 is a rough block diagram of constitutions on the transmitting end and the receiving end related to the transmitting method described in claim 1 of the invention.

The images and voices of the musical performance 1 performed on the transmitting end are converted to image signals and voice signals respectively by the use of a TV camera 2 and a microphone 3, and led to an image-voice-data packet multiplexer 8 through delaying devices 4 and 5 to cope with delay caused by the process of respective data coding. On the other hand, musical instrument performance information is led through a means such as a MIDI to a performance information encoder 7a which codes the information while referring to signals from a reference clock 6. The output from the encoder 7a is arranged into packets with a packet encoder 7b and led, like the images and voices, to the image-voice-data packet multiplexer 8. The image signals, the voice signals, and the digital data signals made by multiplexing the performance information packets undergo multiplexing process through the multiplexer 8 and sent out for example to a broadcast satellite.

On the receiving end, the signals from the broadcast satellite are separated into respectively image signals, voice signals, and performance information data packets through an image-voice-data packet separator 9. The image signals are displayed on a cathode-ray tube (CRT) 10, and the voice signals are reproduced with a speaker 11. The performance information data packets are led to a packet decoder 13a and then to a performance information decoder 13b which converts the packets into performance data while referring to signals from the reference clock 12. The performance data are reproduced as musical performance using a MIDI or the like. The method of matching the reference clocks on the transmitting and receiving ends is the same as that described in the patent application (1). That is, the reproduction time on the receiving end is calibrated with super-frame pulses. From the transmitting end, the time information of the super-frame pulses for the reproduction time calibration is sent out, ahead by a predetermined specified time that is at least a period of two super-frames. Here, the super-frame consists of nine frames, with each being 1 millisecond (msec.). Details of the super-frame are described in the patent application (1).

Next will be described the method of coding the performance information used in this invention. The method is capable of synchronous reproduction with other information by the use of time information and has the effect of data compression.

An example of input is shown by the use of a MIDI. Performance information of the tone pitch and the tone intensity is inputted as an event every time a tone is produced or a change occurs in the tone state. To describe in reference to Table 1 and FIG. 2, Table 1 shows examples of events that occur at respective time points. These events are inputted to a packet encoder 7 according to the timing shown with MIDI data shown in FIG. 2. The

inputted events are coded in succession to form packets. The packets are in the format shown in FIG. 3; the first packet, the second packet, the third packet, and so on. A packet is sent out when the packet is fully packed with data or when a specified period of time (100 milliseconds in the example shown in FIG. 3) elapses from the topmost data in the packet. In FIG. 3, the first and the second packets are examples of being sent out when each packet is fully packed with data, and other packets are examples of being sent out when a specified period of time elapses. When no event occurs, no packet is sent out.

Table 1

Group	Time(ms)	Pitch	Intensity	Group	Time(ms)	Pitch	Intensity
a	0	70	99	c	174	74	70
	3	64	107	d	229	70	0
	4	70	0		235	74	0
b	80	69	82		241	70	82
	83	69	0		244	70	0
	89	67	82	e	342	69	72
	93	67	0		396	69	0
	100	74	93	f	482	67	69
	101	64	0	g	739	67	0
	105	74	0		744	70	72
	106	64	81		748	74	72
	111	64	0		780	70	0
c	171	70	72		785	74	0

The symbols h, i, j, k, l, m, and n in FIG. 2 correspond respectively to the 1st, 2nd, 3rd, 4th, 5th, 6th, and 7th packets shown in FIG. 3. In FIG. 3, the portions with reference numbers 71, 72, 73, and 74 are the values of a time point data, a music data, an event, and an elapsed time. They are actually indicated in digits. The portions with an asterisk (*) show those without effective elapsed event time.

Since the packets sent out are multiplexed together with other service packets to be transmitted, the delay time before being received is indefinite. Therefore, it is necessary to take a certain delay margin depending on the system used. FIG. 2 shows an example case of taking a margin of 100 milliseconds. Delaying devices for image signals and voice signals shown in the block diagram of FIG. 1 are inserted for taking the delay margin. The time difference seen in the figure between sending and receiving is due to the distance to and from the satellite.

Next will be described the format of transmission packets shown in FIG. 3. The format shown in FIG. 3 corresponds to the example packets for transmission shown in

Table 1 and FIG. 2. Each packet consists of a time data 71 first, followed by music data 72. The time data 71 indicates the time point (in milliseconds) at which the first event of the music data 72 occurs. The music data are constituted with an alternate arrangement of event contents 73 and elapsed time 74 between events. A time point of reproducing an event other than the first event in each packet is obtained by summing up the elapsed time accumulated in the time data 71.

The transmitting apparatus as a second embodiment of the invention and the receiving apparatus as a third embodiment of the invention described herein may be realized similarly using the method described above in relation to the first embodiment with a rough block diagram of constitutions shown in FIG.1. Therefore, detailed descriptions of them are omitted.

While the data channels described here are those of a broadcast satellite as examples, they may be any other data channels than those of the broadcast satellite.

Effect of the Invention

When the musical performance data are sent according to this invention as described above, a dedicated transmission route is unnecessary. Even with a transmission route through which real time transmission is difficult such as the data channel of a broadcast satellite, real time transmission becomes easy by permitting a certain time of delay of data. In this way, capacity and efficiency of transmission are remarkably increased.

The method of reproduction while referring to time information makes the constitution on the receiver simple as interruption process for real time process is reduced. Burden on the receiver is alleviated as the delay process for the image signals and voice signals is done on the transmitting end.

Furthermore, in case synchronization among images, voices, and performance is to be done with a wired system, delay process must be done for image and voice signals corresponding to the delay peculiar to a specific musical instrument. In case of this invention, however, the delay process can be included advantageously in the delay process for the image and voice signals corresponding to the delay for data compression.

Brief Description of the Drawings

FIG. 1 is a rough block diagram of constitutions on the transmitting end and the receiving end related to the transmitting method of the invention.

FIG. 2 is a timing chart of respective transmitting and receiving events of musical performance according to the invention.

FIG. 3 shows an example of packet format according to the invention.

Description of Reference Numerals

1: Musical performance 2: TV camera 3: Microphone 4, 5: Delay devices 6, 12: Reference clocks 7: Performance information and packet encoder 8: Image-voice-data packet multiplexer 9: Image-voice-data packet separator 10: CRT 11: Speaker 13: Performance information decoder and packet decoder 14: Musical instrument 71: Time data 72: Music data 73: Event contents 74: Elapsed time

Fig. 1

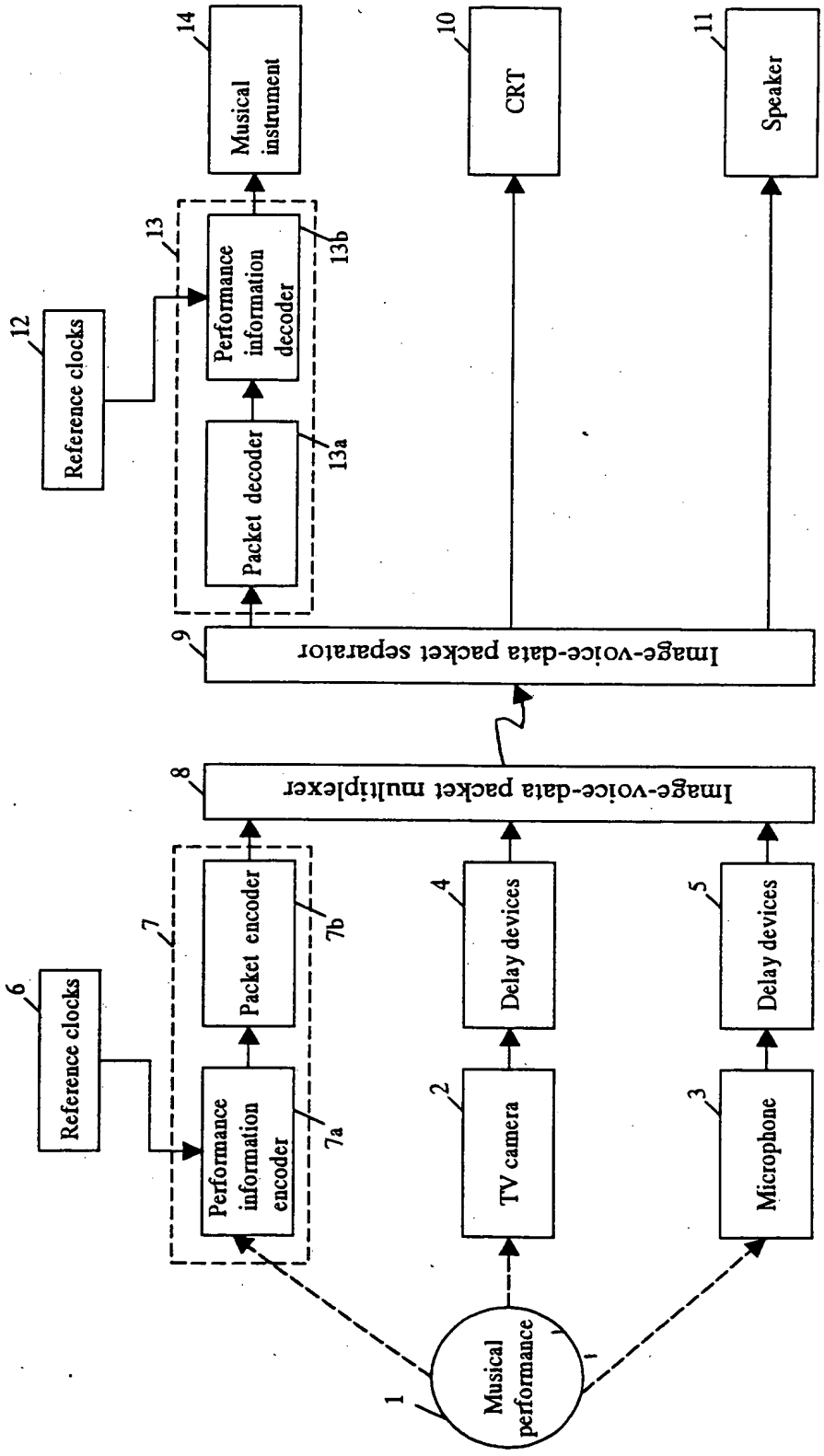

1
Musical performance
2
TV camera
3
Microphone
4
Delay devices
5
Delay devices
6
Reference clocks
7
7a
Performance information encoder
7b
Packet encoder
8
Image-voice-data packet multiplexer
9
Image-voice-data packet separator
10
CRT
11
Speaker
12
Reference clocks
13
13a
Packet decoder
13b
Performance information decoder
14
Musical instrument

Fig. 2

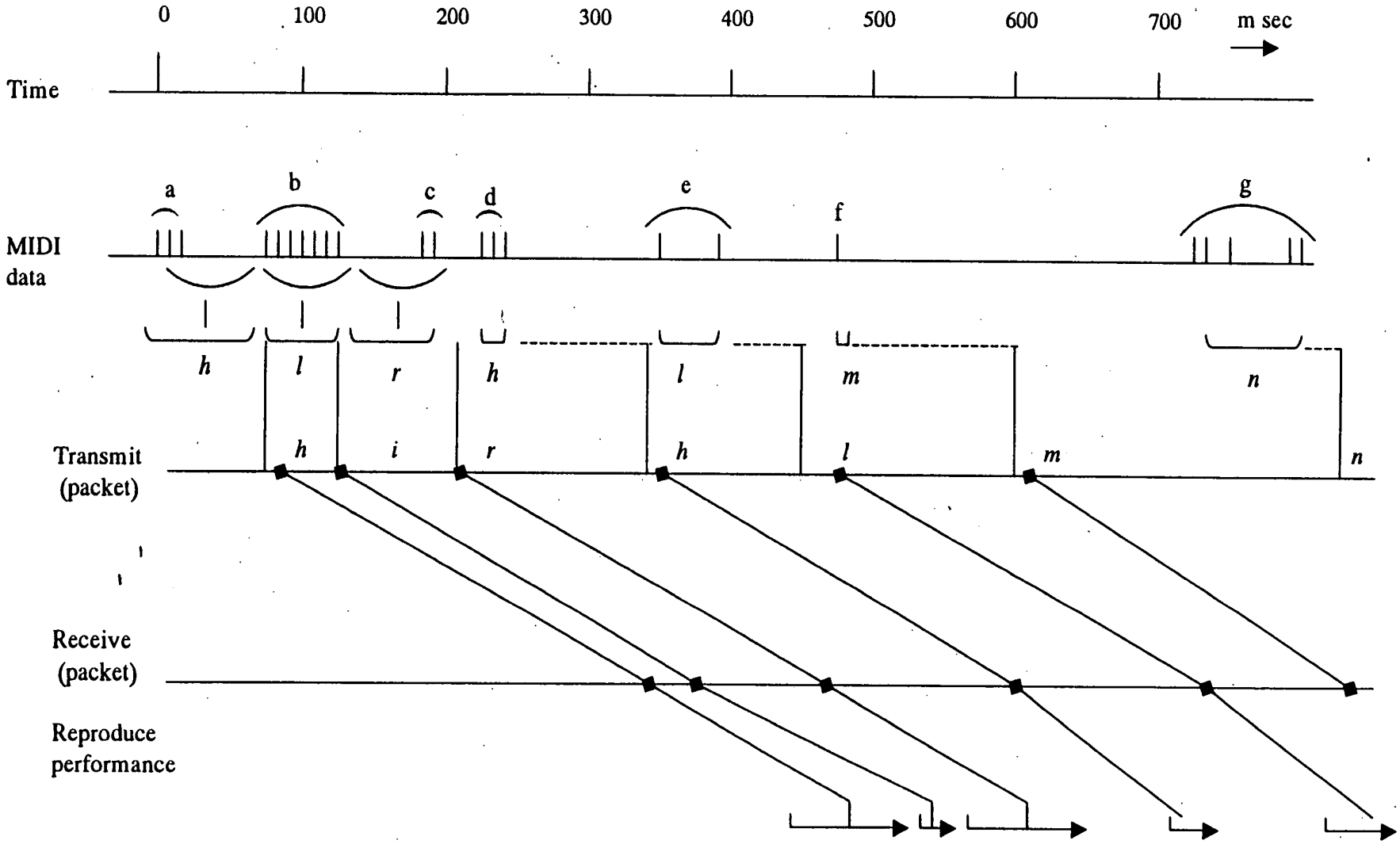
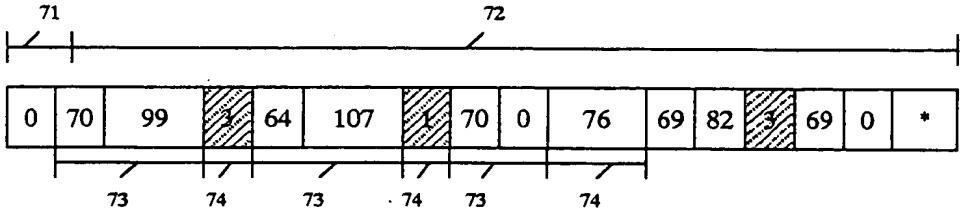

0
100
200
300
400
500
600
700
m sec
Time
a
b
c
d
e
f
g
MIDI
data
h
l
r
h
l
m
n
Transmit
(packet)
h
i
r
h
l
m
n
Receive
(packet)
Reproduce
performance

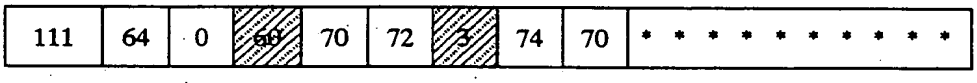
Fig. 3

1st packet



2nd packet

3rd packet



4th packet

5th packet

6th packet

7th packet